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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/688,073

10/17/2003

Yoshihiro Okada

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HOGAN & HARTSON L.L.P.
1999 AVENUE OF THE STARS
SUITE 1400
LOS ANGELES, CA 90067

EXAMINER

YEUNG LOPEZ, FEIFEI

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

10/18/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/688,073

Applicant(s)

OKADA ET AL.

Examiner

Feifei Yeung-Lopez

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 1/9/06.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1 and 3 are objected to because of the following informalities: Regarding claims 1 and 3, "the semiconductor region" on lines 17-18 in claim 1 and lines 1-2 in claim 3 should be "the reverse conductive semiconductor region." Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Wada (US Patent 5,220,185).

4. Regarding claim 1, Wada teaches a solid image capturing element, comprising: a plurality of vertical shift registers (53 in fig. 5) arranged to each correspond to a column of a plurality of light receiving pixels (element 51 in fig. 5) in a matrix arrangement, a horizontal shift register (element 55 in fig. 5) provided on an output side of the plurality of vertical shift registers, and an output section (element 20 in fig. 1) provided on an output side of the horizontal shift register, wherein a reverse conductive semiconductor region (n-well on top of the p-well in fig. 1) is formed over one major surface of one conductive semiconductor substrate (substrate 11 in fig. 1), the plurality of light receiving pixels, the plurality of vertical shift registers, the horizontal shift register, and

the output section are formed in the semiconductor region, and the concentration of dopants in a portion of the semiconductor region where the output section is formed is higher than the concentration of dopants in another portion (e.g. element 22 in fig. 1) of the semiconductor region where the horizontal shift register is formed.

5. Regarding claim 2, Wada teach the solid image capturing element according to claim 1, further comprising: an output gate (element 16 in fig. 1) formed on the semiconductor substrate at a boundary between the horizontal shift register and the output section.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wada (US Patent 5,220,185) as applied to claim 1 above, and further in view of Yamada (PG Pub 2002/0039144 A1).

9. Regarding claim 3, Wada remains as applied in claim 1.

10. However, Wada does not teach the concentration of dopants in the portion of the semiconductor region where the horizontal shift register is formed is higher than the concentration of dopants in a still further portion of the semiconductor region where the plurality of light receiving pixels and the plurality of vertical shift registers are formed.

11. In the same field of endeavor, Yamada teaches the concentration of dopants in a portion of a semiconductor region where a horizontal shift register is formed is higher than that of the regions where a plurality of light receiving pixels and a plurality of vertical shift registers are formed (see paragraphs [0010], [0022], [0023], and [0082], where Yamada teaches that the HCCD has a n+ impurity region, a higher impurity concentration, while VCCD and the pixels only have n impurity) for the benefit of making a smaller device (abstract).

12. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the concentration of dopants in the portion of the semiconductor region where the horizontal shift register is formed is higher than the concentration of dopants in a still further portion of the semiconductor region where the plurality of light receiving pixels and the plurality of vertical shift registers are formed for the benefit of making a smaller device.

13. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada (US Patent 5,220,185) in view of Harada (US Patent 5,898,195).

14. Regarding claim 4, Wada teaches a method for manufacturing a solid image capturing element having a plurality of vertical shift registers arranged to each

correspond to a column of a plurality of light receiving pixels in a matrix arrangement, a horizontal shift register provided on an output side of the plurality of vertical shift registers, and an output section provided on an output side of the horizontal shift register, comprising: a first step of forming over one major surface of a conductive semiconductor substrate (11 in fig. 3C) a first reverse conductive semiconductor region (17 in fig. 3A) having a first dopant concentration; a second step of forming over the one major surface of the conductive semiconductor substrate a second reverse conductive semiconductor region (19 in fig. 3B) having a second dopant concentration; and a third step of forming the horizontal shift register (on the right side of fig. 3C) on the first reverse conductive semiconductor region and the output section (on the left side of fig. 3C) on the second reverse conductive semiconductor region.

15. However, Wada does not teach that the second dopant concentration is higher than the first dopant concentration.

16. In the same field of endeavor, Harada teaches using a higher dopant concentration at a charge storage (element 7 in fig. 1, which is analogous to 19 in Wada's invention and the second dopant concentration as claimed) for the benefit of reducing dark current (column 1, lines 44-48).

17. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the second dopant concentration higher than the first dopant concentration for the benefit of reducing dark current.

18. Regarding claim 6, Wada teach that the method for manufacturing a solid image capturing element according to claim 4, wherein a dopant (n-type region on top of the p-

type region, which contacts substrate 11, in figs. 3A-3C) is doped in a stepwise manner to the first reverse conductive semiconductor region and the second reverse conductive semiconductor region, and doping of the dopant is performed commonly at least once to the first reverse conductive semiconductor region, the second reverse conductive semiconductor region, and the third reverse conductive semiconductor region (note in figs. 3A-3C and fig. 5 Wada teaches that the output section, the horizontal and the vertical shift registers, and the pixels are formed on the same substrate, therefore the n-type region is doped in all three regions at once.)

19. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wada (US Patent 5,220,185) in view of Harada (US Patent 5,898,195) as applied to claim 4 above, and further in view of Yamada (PG Pub 2002/0039144 A1), still further in view of Tohyama (US Patent 6,018,169).

20. Regarding claim 5, the previous combination remains as applied in claim 4.

21. Furthermore, Harada teaches forming a light receiving pixel and a vertical shift register in a semiconductor region at one step (figs. 4A-4F).

22. However, Harada does not teach a third dopant concentration lower than the first dopant concentration.

23. In the same field of endeavor, Yamada teaches a dopant concentration in a vertical shift register region and a pixel region are lower than that of a horizontal shift register region (see paragraphs [0010], [0022], [0023], and [0082]) for the benefit of making a smaller device (abstract).

24. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to make a third dopant concentration lower than the first dopant concentration for the benefit of making a smaller device.

25. Finally, also in the same field of endeavor, Tohyama teaches that a horizontal shift register should be made before a vertical shift register (column 16, lines 54-58) for the benefit of ease of production (abstract). Note that Harada teaches that a vertical shift register and a pixel can be made together (figs. 4A-4F).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Feifei Yeung-Lopez whose telephone number is 571-270-1882. The examiner can normally be reached on 7:30am-5:00pm Monday to Friday.

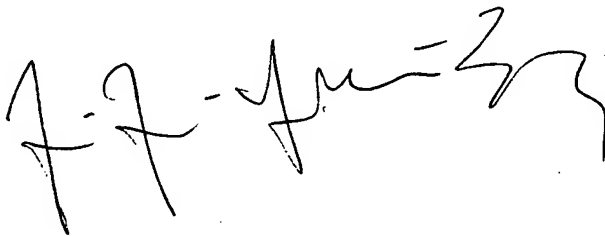
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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FYL

A handwritten signature in black ink, appearing to be "F. J. - [unclear] - 3".A handwritten signature in black ink, appearing to be "Leonardo Andujar".
LEONARDO ANDUJAR
PRIMARY EXAMINER